Strategic Plan for IVHS / CVO in Oregon

July 1993

Oregon Department of Transportation

Oregon Public Utility Commission

Acknowledgements

This Strategic Plan was developed through a series of meetings involving private and public sector participants. The guidance and input from these individuals was invaluable in reaching a consensus and is greatly appreciated. The assistance of IVHS AMERICA for allowing the use of materials from Strategic Plan for Intelligent Vehicle-Highway Systems in the United States is also gratefully acknowledged.

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Since the mid-1980's the Department of Transportation and the Public Utility Commission have been developing and testing a variety of technologies to improve the operation and regulation of commercial vehicles traveling in Oregon. These technologies, known collectively as Intelligent Vehicle-Highway Systems or IVHS, are now mature enough to allow widespread deployment. The systems recommended in this plan will provide significant benefits for industry, government and the motoring public. Motor carriers will operate more efficiently, government activities will be more effective and highway operations generally will be improved.

Goals for IVHS in the U.S.

- Improved safety
- Reduced congestion
- Increased and higher quality mobility
- Reduced environmental impact
- Improved energy efficiency
- Improved economic productivity
- A viable U.S. IVHS industry

The plan calls for the construction and operation of an automated heavy vehicle monitoring system at existing weigh stations and ports-of-entry and at other selected sites along Oregon's road system. This system will reduce traffic delay by permitting safe, legally operating commercial vehicles to bypass these facilities. The system will also allow the state to more effectively focus enforcement efforts on suspected violators. Safety will be enhanced, tax evasion will be reduced and the highway infrastructure will be better protected against overloaded trucks. The plan also anticipates the need to integrate with other IVHS systems.

This plan covers the first six years of a long range vision for improving commercial vehicle operations in Oregon.

Introduction

As Oregon entered the last decade of the twentieth century, a heightened sense of urgency relating to transportation problems and opportunities emerged. Increased traffic congestion, land use and air quality mandates, the need to compete in a global marketplace and a growing awareness that Oregon could not simply build more roads to satisfy the increasing demand for mobility provided the impetus to consider new ways to meet the transportation challenges of the twenty-first century.

Aware of these challenges, the Oregon Transportation Commission adopted the Oregon Transportation Plan. This plan was developed to provide long range strategic direction for public transportation investments over the next twenty years. The plan calls for a transportation system that is safe, convenient and efficient and which promotes economic prosperity and livability. The plan also identifies corridors that are judged to be of interstate and statewide importance, including the Access Oregon Highways routes and Highways of National Significance. These highway corridors allow the movement of people and goods around the state and carry most of the commercial traffic.

The Oregon Transportation Plan recognizes the role of technology in helping to achieve the purposes of the plan. The federal government has also recognized that advanced technology

can help alleviate surface transportation problems and has established and funded a program to develop a group of technologies known as Intelligent Vehicle-Highway Systems (IVHS). IVHS has the potential to improve safety, reduce congestion, enhance mobility, mitigate environmental damage, save energy and promote economic productivity.

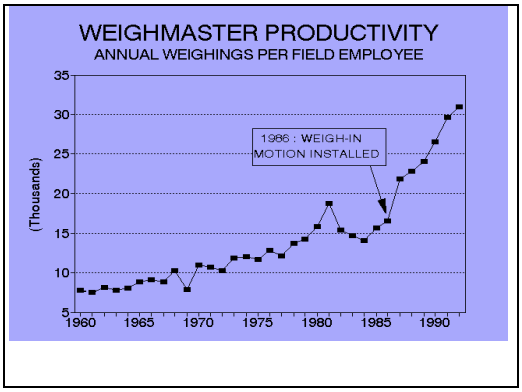
Oregon began to develop an IVHS strategic and business plan for commercial vehicle operations (CVO) in late 1992. A series of meetings were held to develop a strategic vision, mission, goals, and objectives. Critical issues were defined and potential tactics were explored. Based upon this input, this Strategic Plan for IVHS/CVO in Oregon was produced. It's purpose is to guide the evolution of IVHS/CVO over the next six years.

Issues and Opportunities and Opportunities

Commercial vehicles are a primary user of Oregon's transportation system. Commercial vehicles travel millions of miles in Oregon each year, carrying millions of tons of goods along the state's highways. It is difficult to overstate the critical role of an efficient highway system to our economy.

The safe movement of goods is a primary concern. Thousands of deaths, millions of injuries and billions of dollars in property damage occur on our nation's highways each year. Incidents involving commercial vehicles can be especially severe.

"IVHS is the key to reducing industry and government costs."



IVHS can significantly reduce the number and severity of incidents involving commercial vehicles. By reducing the number of highway exits and entrances around weigh stations and increasing the operational efficiency of motor carriers, exposure to incidents will be proportionately lessened. Most incidents are attributed to driver error; introducing in-vehicle and roadway safety enhancements assisting the driver to avoid accidents can decrease the probability that the driver will make a serious error.

In order to do business in Oregon, motor carriers must spend many millions of dollars each year to conform with regulatory requirements. Carriers must file an immense amount of paperwork with numerous government agencies. The American Trucking Association and the National Private Truck Council estimate that $5-6 billion is spent annually by U.S. carriers to administratively comply with regulatory and taxation laws. States are estimated to spend an additional $3-5 billion to perform their regulatory and taxation functions. In Oregon alone, the annual state budget for motor carrier regulation and taxation is approaching $30 million per year. These costs directly affect the competitive position of Oregon's economy.

IVHS/CVO is the key to reducing these industry and government costs. CVO is clearly leading the way in the application of IVHS technologies. Several large commercial vehicle fleets are using

automatic vehicle location, on-board computers with text and map displays, routing algorithms, vehicle tracking, and two-way communications to allow faster dispatching, fuel efficient routing, and more timely pick-up and delivery services. Motor carriers will directly benefit from Oregon's public investment in IVHS/CVO by reduced delay at weigh stations, fewer filings with authorities as trucks move between states and better information for fleet management.

Oregon is also looking to early deployment of IVHS technologies to monitor and regulate commercial vehicles. Oregon participates in the HELP/Crescent demonstration, an operational test of IVHS technologies that allow individual trucks to be uniquely identified, classified, weighed, and checked against a credentials database while the truck is in motion. These technologies reduce the time trucks spend in weigh stations, increase traffic throughput, and reduce state enforcement costs. Due to IVHS technology, weighmaster productivity has doubled since 1985 and is virtually indispensable at high volume weigh stations. With additional IVHS investment, it will be possible to fully automate some weigh station operations.

IVHS/CVO can also improve the administrative efficiency and fairness of Oregon's tax system. Automated weight-mile tax reporting becomes feasible with IVHS/CVO. Tax evasion can also be reduced, helping to create a level playing field for the motor carrier industry and

helping to assure that legally operating trucks are not placed at a competitive disadvantage.

Many people are concerned that the data collected for IVHS will infringe upon the privacy of individual vehicle operators and owners. The HELP/Crescent operational test has addressed this issue. A solution was found by using a third-party contractor to manage the data and act as a buffer between public and private participants. Strict limitations were placed on access to individual company data.

The privacy issue will continue to be dealt with at every stage of design, development and deployment, assuring adequate protection against inappropriate uses of the data. The systems and program should continue to be voluntary, access to data must be strictly limited and the least intrusive means available to obtain data should be used. Data collection should focus on monitoring vehicles rather than persons. As the benefits from participation are shown to outweigh any potential privacy loss, greater acceptance and support will follow.

Vision, Mission, Goals and Objectives

Vision, Mission, Goals and Objectives

Oregon shares the belief that the extensive use of advanced technology and information systems can significantly improve the safety and performance of surface transportation while reducing negative energy and environmental impacts. In the commercial vehicle area, Oregon's vision can be summarized as follows:

Legal commercial vehicles operate safely with the same ease as passenger vehicles.

To realize this vision, Oregon's IVHS\CVO mission is to:

Develop and deploy advanced technology to improve the efficiency of commercial vehicle operations, to increase the performance of the highway system and protect the public investment in that system .

Oregon's operational goals and objectives for IVHS/CVO are listed below. They are not ranked by order of importance but are considered to be mutually reinforcing and interrelated.

Goal 1: Benefit motor carrier industry through increased productivity for legal commercial vehicle operations.

Objectives:

A. Reduce travel delay.
B. Reduce administrative burden.
C. Provide new information services.
D. Provide a consistent and equitable regulatory environment.

Goal 2: Benefit government through increased efficiency and effectiveness.

Objectives:

A. Make enforcement activities more effective.
B. Improve compliance with regulations.
C. Reduce administrative and operational costs.
D. Improve government cooperation and coordination.
E. Protect the financial and physical integrity of the public infrastructure.

Goal 3: Benefit the public through improved highway safety and operations.

Objectives:

A. Reduce number and severity of highway incidents.
B. Reduce the impact of highway incidents on traffic operations.
C. Improve the operational efficiency of the public infrastructure.

Strategic IssuesIssues

During the course of the strategic planning meetings many issues emerged that were judged to be of strategic importance. Concerns about the evolving nature of the technologies, the need to involve all transportation stakeholders, how to develop mutually beneficial

partnerships and the need to rapidly produce tangible benefits were frequently expressed. These concerns centered on two common themes; development vs. deployment and autonomy vs. coordination. A consensus was reached on both points.

Development vs. Deployment

While the continuing need for further research and development, establishing protocols and standards, and systems integration with other IVHS functional areas is recognized, the IVHS/CVO program should now be biased toward immediate deployment of those technologies that have proven workable. Oregon has been involved in the development and testing of IVHS/CVO systems for eight years and the program will not advance unless deployment occurs soon and demonstrable benefits are shown. There will always be new technological capabilities on the horizon; the case for waiting for emerging technology can be made perpetually. Flexible, modular components should be used to allow system integration to advance and avoid functional obsolescence.

Autonomy vs. Coordination

The need for tightly coordinated IVHS planning and deployment among all public jurisdictions is apparent. A profusion of dissimilar systems will severely handicap the effectiveness of IVHS as vehicles travel between states and move from state highways to local roads. For commercial vehicle applications the inter- and intra-jurisdictional problems are particularly acute. Among the greatest

benefits associated with IVHS/CVO is the concept of transparent borders, reducing the delay and expense associated with licensing, registration, verifying credentials, weighing, permitting and the payment of taxes in each state the vehicle travels in. Transparent borders can only be achieved through often strenuous negotiations among government agencies to harmonize the statutes, regulations, policies and practices in all jurisdictions interstate commercial vehicles travel through.

IVHS/CVO will not operate in isolation from other IVHS efforts (e.g. Advanced Traffic Management Systems). As a generalized IVHS program is established in Oregon and surrounding states, the commercial vehicle program will need to be integrated into a larger system.

Acknowledging that these institutional barriers are often more challenging than addressing technical problems, Oregon should be fully involved in all significant IVHS and IVHS/CVO regional and national forums and partnerships. However, these efforts will not be allowed to seriously delay Oregon's IVHS/CVO deployment schedule.

Oregon intends to maintain flexibility so that as national and regional standards for equipment and information systems are developed, Oregon will be able to adapt. By preserving autonomy in data management, Oregon will be able to link to any system. Delays in setting standards will not be allowed to thwart prompt deployment.

Key StrategiesStrategies

Several complimentary elements of an IVHS/CVO strategy have emerged that should form the basis of a successful program. These elements are reflected in the choice of tactics selected for the business plan. Central to each of these elements are the concepts of mainline preclearance, an integrated tactical enforcement network and safety enhancements.

Mainline Preclearance

Mainline preclearance is the use of automatic vehicle identification (AVI) and weigh-in-motion (WIM) devices to preclear vehicles in advance of weigh stations and ports-of-entry, allowing legal vehicles to bypass the facilities. Mainline preclearance is operational at one California weigh station and Oregon is operating three systems, two on I-5 near Roseburg and one on I-82 at Umatilla.

In mainline preclearance, a truck equipped with a communication device called a transponder is uniquely identified with AVI equipment as a weigh station is approached. The truck also passes over a WIM sensor imbedded in the pavement which weighs the truck and determines it's configuration as it travels at highway speed. This information is checked against a central database to assure that operating credentials are in order, necessary permits have been issued, required filings have been made, weight is within declared limits, a recent safety inspection has been performed and the carrier's safety and enforcement record is good. If these criteria are not met, the driver is signaled to enter the weigh station. If the criteria are met, the driver is

signaled to proceed without entering the weigh station.

Mainline preclearance has generated great enthusiasm among some segments of the motor carrier industry. Some carriers estimate that travel delays in weigh stations and ports-of-entry cost up to a dollar per minute. These carriers are expected to become early participants in the program. Aside from the reduction in travel delay, carriers also see great benefit in using data collected about their trucks for fleet management and as a record of truck configuration.

"Mainline preclearance has generated great enthusiasm among some segments of the motor carrier industry."

Mainline preclearance also allows more effective enforcement of weight and tax laws and can provide safer travel by reducing the number of highway exits and entrances and reducing congestion around weigh stations. By allowing legally operating trucks to pass the weigh station, enforcement personnel can focus efforts on fewer vehicles. "Wave-throughs", which occur when the volume of trucks exceeds the capacity of the weigh station, can be reduced. Expanding the capacity of existing weigh stations as freight volumes grow can be avoided or reduced.

Mainline preclearance is a means to support all three of Oregon's IVHS/CVO goals, the Oregon Transportation Plan and the Access Oregon Highway program. As more and more carriers take notice of the direct benefits from this service, participation will increase and momentum will build to provide other IVHS/CVO services.

Integrated Tactical Enforcement Network

An Integrated Tactical Enforcement Network (ITEN) is a collection of remote sensing devices located on and off the state highway system. ITEN will provide a management tool for more effective utilization of enforcement personnel. These devices would include a combination of WIM and/or a AVI system on key bypass routes used by vehicles attempting to evade weigh stations and ports-of-entry.This system would allow enforcement personnel to be mobilized when and where the weight and traffic data indicate illegal truck operations are occurring. Vehicle identification technology can be used to identify overweight and illegally operating vehicles as they pass the site. As a dense network of these devices is established, illegal operators will find that the circuitous routing necessary to avoid the sites will offset any competitive advantage gained by operating illegally. This network will reduce tax evasion, improve regulatory compliance and make enforcement activities more effective.

When configured with AVI devices, these ITEN sites can also be used to develop an automated tax reporting system for vehicles equipped with on-board computers. The sites will also gather valuable information for highway planning and engineering functions.

Safety Enhancements

This plan also includes several projects focused on safety goals. Site-specific highway warning systems could be installed at areas where weather related hazards for trucks are common. Certain mountain passes will be equipped with

devices that measure the speed of passing trucks and provide a variable message sign to indicate safe operating speed under existing weather conditions. Other areas with recurring visibility, wind and ice problems will also be equipped with dynamic warning systems.

During the last four years of the plan a more ambitious program of vehicle and driver safety monitoring becomes possible. On-board systems and vehicle-to-roadside communications should reach a stage allowing operational testing of hazardous materials information systems. Automated driver logs and real-time driver/vehicle safety monitoring systems also become feasible. A voluntary approach to driver monitoring should reassure those with concerns about individual privacy.

Financial OptionsOptions

The federal, state and local governments and industry each have roles and responsibilities under this plan. The federal government is primarily responsible for the planning and funding of research and development, operational testing and some initial deployment. State and local government will provide the infrastructure and industry will invest in equipment for invividual vehicles.

There is considerable flexibility in funding the state and local government portion of Oregon's IVHS/CVO business plan. Options that have been discussed include:

Charge all costs to heavy vehicles

through the weight mile tax. Under this option the cost of constructing and operating the IVHS/CVO network would be charged to trucks under Oregon's cost responsibility study. The advantages of this option are simplicity, certainty and equity. Initial users of the system should not be expected to bear the entire cost of installing the system.

Charge a high initial and annual fee for each transponder installed. Under this option a fixed fee is charged annually for heavy vehicles to use the system.

Charge a variable fee each time a participating carrier bypasses the weigh station. Under this option a carrier is charged a variable fee each time the system is used. The level of the fee is determined by the amount of delay experienced at the weigh station site (e.g. one dollar at sites with significant delay, fifty cents at sites with moderate delay).

A combination of tax and fee support. Under this option construction and program costs are capitalized with weight mile taxes and are offset or recovered through the efficiencies, incentives and fee strategies as the program is established.

The last option is probably the best. It allows most of the initial costs in facility construction to be borne by all heavy vehicles and the program has some benefit to all users. It also allows proportionately higher costs to be charged to carriers who benefit directly

from the program based upon how frequently they use the facilities.

An additional finance option becomes available when automated tax reporting capabilities are realized. Government will be able to administer the tax laws more efficiently with a substantial reduction in costs. Carriers using automated reporting could share in the state cost savings, possibly with a lower tax rate or tax credit for those participating in the program.

Cost - Benefit Analysis- Benefit Analysis

An exhaustive cost-benefit analysis of the mainline preclearance and tactical enforcement strategies outlined here were performed as part of a 1988 Transportation Research Board report. An Oregon-specific appendix is included.

Mainline Preclearance

Mainline preclearance is a cost-effective investment when both public and private costs and benefits are considered. The critical variable is the number of trucks that install AVI and participate in the program. The break-even point occurs when ten percent of the trucks are equipped with AVI. The participating carriers gain from operating time savings. Oregon's experience indicates that the break-even point for the public sector is even lower. This element also allows the state to avoid the cost of expanding weigh stations as capacity constraints are reached. Government will be able to maintain service levels without hiring new weighmaster personnel, helping to stem the growth of public sector payrolls. The systems installed at Roseburg and Umatilla have already demonstrated the cost-effectiveness of deploying these

technologies.

When sixty percent of trucks participate in the program, each dollar of cost is offset by nearly 3.6 dollars in benefit.

Weight Enforcement

According to the TRB study, the Integrated Tactical Enforcement Network described here would also be cost-effective investment, resulting in three dollars in benefit for each dollar invested. This estimate includes the benefit of less pavement damage due to deterred overweight travel, but does not include additional weight-mile taxes that are now evaded. For each one percent reduction in tax evasion achieved by this plan over two million dollars in additional tax revenue will be collected.

Other Benefits

Automated tax reporting, transparent borders and one-stop shopping are also direct tangible benefits from this plan. The Oregon Public Utility Commission estimates that automated tax reporting could reduce the state's costs by nearly $40 per year per truck while private sector savings per truck should be comparable. Transparent borders and one-stop shopping will yield similar saving for each vehicle. Additional benefits without additional costs are derived from improved safety and better traffic data for highway capacity analysis, pavement design and pavement management strategies. Data collection for these functions using WIM and AVI devices is more cost effective than the labor-intensive methods currently used. The traffic data will also augment the new

management systems required by the federal government.

Business PlanPlan

Program and Project Summary

Oregon's IVHS/CVO plan contains five program elements: construction, operations and maintenance, information systems, R & D and testing, and planning. A summary of each element begins on the next page.

Steering Group

The managers of the following organizations will be jointly responsible for executing this plan:

ODOT Motor Carrier Services (MCS)
ODOT Future Technology Research (FTR)
PUC Motor Carrier Services (PUC)
ODOT Information Systems Branch (ISB)
ODOT Traffic Engineering Section (TES)

One additional steering group member shall be chosen to represent the motor carrier industry.

Implementation Teams

The steering group shall assure coordination with all parties directly affected by the IVHS/CVO program and will oversee the work of the implementation teams assigned to each program element.

Technical Advisory Team

The steering group shall appoint a technical advisory team to assist with the timely assessment of new and existing technologies and their application to the IVHS/CVO program. This team will consist of persons with extensive knowledge of existing technologies and

applications, an understanding of IVHS/CVO technology needs and a broad understanding of the implementation process for new technologies and products.

ODOT's Motor Carrier Services is assigned the role of lead agency and project manager.

The steering group shall obtain necessary approvals to begin work in 1993 and inclusion in ODOT's next Transportation Improvement Plan.

Milestones and Performance Measures

The steering group shall identify appropriate milestones and performance measures to assure the timely and effective implementation of this business plan. Periodic progress reports will be prepared for review by all interested parties.

Table 1: IVHS/CVO Program Summary (1993 Dollars)

Program Area	Total Program Cost	Recommended Funding					
		1994	1995	1996	1997	1998	1999
Construction	$13,200,000	$2,200,000	$2,200,000	$2,200,000	$2,200,000	$2,200,000	$2,200,000
Operations & Maintenance	$4,620,000	$220,000	$440,000	$660,000	$880,000	$1,100,000	$1,320,000
Information Systems	$4,140,000	$940,000	$920,000	$570,000	$570,000	$570,000	$570,000
R&D/Testing	$870,000	$320,000	$100,000	$100,000	$150,000	$100,000	$100,000
Planning/ Coordination	$506,000	$121,000	$71,000	$76,000	$76,000	$81,000	$81,000
IVHS/CVO Total	$23,336,000	$3,801,000	$3,731,000	$3,606,000	$3,876,000	$4,051,000	$4,271,000

Table 2: Automated Systems Construction (1993 Dollars)

Project Name	Project Description	Implement Team	Years	Total Project Cost	Fiscal Year Funding Recommendations						Benefit	Stakeholders	Supports Goal/Objective
					1994	1995	1996	1997	1998	1999			
Install Weigh-in-Motion and Automatic Vehicle Identification	Phase 1: I-84 - 6 WIM/AVI Sites I-5 - 1 WIM/AVI Site	MCS, TES, Regional Managers	1	$2,100,000	$2,100,000	$0	$0	$0	$0	$0	Mainline sorting, greater throughput, improved safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Install Weigh-in-Motion and Automatic Vehicle Identification	Phase 2: 14 WIM/AVI Sites on State Primary System Using Corridor Studies	MCS, TES, Regional Managers	2	$4,200,000	$0	$2,100,000	$2,100,000	$0	$0	$0	Mainline sorting, greater throughput, improved safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Install Weigh-in-Motion and Automatic Vehicle Identification	Phase 3: WIM/AVI and WIM only sites on and off State Highway System	MCS, TES, Regional Managers, Counties	3	$6,300,000	$0	$0	$0	$2,100,000	$2,100,000	$2,100,000	Better weight and tax enforcement, safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Install Site-Specific Dynamic Warning Systems for Trucks	Warning systems providing information for specific truck configurations (e.g., steep grades, rollover hazard, weather related)	MCS TES	6	$600,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	Improved safety	Motor carriers, state and local government, motorists	3A
Total Construction				$13,200,000	$2,200,000	$2,200,000	$2,200,000	$2,200,000	$2,200,000	$2,200,000			

Table 3: Automated Systems Operation & Maintenance (1993 Dollars)

Project Name	Project Description	Implement Team	Years	Total Project Cost	Fiscal Year Funding Recommendations						Benefit	Stakeholders	Supports Goal/Objective
					1994	1995	1996	1997	1998	1999			
Sensor Calibration	Calibration of WIM & AVI devices to acceptable tolerances (15% of O&M cost)	MCS	6	$693,000	$33,000	$66,000	$99,000	$132,000	$165,000	$198,000	Mainline sorting, better weight and tax enforcement, safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Hardware/Software Upgrades	Acquire hardware and software upgrades of installed systems (10% of O&M cost)	MCS	6	$462,000	$22,000	$44,000	$66,000	$86,000	$110,000	$132,000	Mainline sorting, better weight and tax enforcement, safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Field Maintenance	Perform field inspection and routine maintenance to assure uninterruptable service (35% of O&M cost)	MCS	6	$1,617,000	$77,000	$154,000	$231,000	$308,000	$385,000	$462,000	Mainline sorting, better weight and tax enforcement, safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Sensor Repair and Replacement, Spare Parts Inventory	Repair sensors in WIM/AVI system, replace as useful life expires and/or performance specifications are changed (15% of O&M)	MCS	6	$693,000	$33,000	$66,000	$99,000	$132,000	$165,000	$198,000	Mainline sorting, better weight and tax enforcement, safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Pavement Rehabilitation	Perform leveling and smoothing of pavements upstream of sensors to assure accurate sensor readings (25% of O&M)	MCS	6	$1,155,000	$55,000	$110,000	$165,000	$220,000	$275,000	$330,000	Mainline sorting, better weight and tax enforcement, safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Total Operations & Maintenance				$4,620,500	$220,000	$440,000	$660,000	$880,000	$1,100,000	$1,320,000			

Table 4: IVHS/CVO Information Systems (1993 Dollars)

Project Name	Project Description	Implement Team	Years	Total Project Cost	Fiscal Year Funding Recommendations						Benefit	Stakeholders	Supports Goal/Objective
					1994	1995	1996	1997	1998	1999			
Database Management and Development	Analyze opportunities to combine databases for greater utility and easier maintenance. Determine needed database architectures.	MCS ISB PUC	6	$1,020,000	$200,000	$180,000	$160,000	$160,000	$160,000	$160,000	Mainline sorting, better weight and tax enforcement, safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Communications Operations (Intrastate)	Identify data collection site to data repository communications needs, analyze capabilities of alternatives.	MCS ISB PUC	6	$120,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	Mainline sorting, better weight and tax enforcement, safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Communications Operations (Interstate)	Identify and perform interstate data communications, coordinate with other states to develop standards and protocols.	MCS ISB FTR PUC	6	$120,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	Mainline sorting, better weight and tax enforcement, safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
System Enhancements	Tax reporting, electronic CV credential system, electronic safety inspection, static to real-time capabilities	MCS ISB PUC FTR	6	$600,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	Reduced administrative burden and cost, improved safety	Motor carriers, state and local government, motorists	1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3B
Applications Development	User interfaces, motor carrier information services, enforcement applications readings	MCS ISB PUC FTR	6	$600,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	Fleet management, improved enforcement	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3C
Central Processing Unit (CPU) Costs	Charges for mainframe computer access and use, installation and replacement of field computers.	ISB MCS ISB	6	$1,600,000	$500,000	$500,000	$150,000	$150,000	$150,000	$150,000	Support for other program areas	Motor carriers, State and local govt., motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C
Systems Integration	Integrating CVO with ATMS, ATIS, AVCS, and APTS programs	FTR ISB PUC TES	4	$80,000	$0	$0	$20,000	$20,000	$20,000	$20,000	Improved efficiency and safety	Motor carriers, state and local government, motorists	1A, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C
Total Information Systems				$4,140,000	$940,000	$920,000	$570,000	$570,000	$570,000	$570,000			

Table 5: IVHS/CVO Research and Development & Operational Tests (1993 Dollars)

Project Name	Project Description	Implement Team	Years	Total Project Cost	Fiscal Year Funding Recommendations						Benefit	Stakeholders	Supports Goal/Objective
					1994	1995	1996	1997	1998	1999			
Western States Transparent Borders (RIB) Project Operational Test	Perform operational test demonstrating "transparent borders" for interstate commercial vehicle operations	MCS ISB FTR PUC	2	$50,000	$25,000	$25,000	$0	$0	$0	$0	Improved carrier productivity	Motor carriers, state government	1A, 1B, 2A, 2B, 2C, 2D
Regional Automated Permit Process (RAPP) Operational Test	Perform operational test demonstrating electronic issuance of extended weight permits	MCS ISB FTR PUC	2	$50,000	$25,000	$25,000	$0	$0	$0	$0	Improved carrier productivity	Motor carriers, state government	1A, 1B, 2A, 2B, 2C, 2D
Slow-Speed Weigh-in-Motion Operational Test (SWIM)	Perform operational test demonstrating the use of slow-speed WIM scales as a direct means of truck weight enforcement.	MCS ISB FTR	1	$90,000	$90,000	$0	$0	$0	$0	$0	Improved carrier productivity, improved enforcement	Motor carriers, state government	1A, 2A, 2E, 3C
Automatic Vehicle Identification Using Vision Technology (VISION)	Perform operational test demonstrating the use of a digital image processing system for reading truck license plates at highway speeds under various conditions.	MCS PUC ISB FTR TES	1	$150,000	$150,000	$0	$0	$0	$0	$0	Improved carrier productivity, improved enforcement	Motor carriers, state government	1A, 1B, 2A, 2B, 2C, 2D, 2E
Electronic Tax Reporting (ETR)	Conduct feasibility study and perform operational test demonstrating the use of AVI and on-board computers to electronically record, report, and audit road use taxes.	MCS PUC ISB FTR	3	$130,000	$30,000	$50,000	$50,000	$0	$0	$0	Improved carrier productivity	Motor carriers, state government	1B, 1D, 2A, 2B, 2C, 2D
Hazardous Materials Information Services	Conduct feasibility study and perform operational test demonstrating the use of technology for hazardous cargo management and incidence response.	MCS PUC ISB FTR TES	2	$100,000	$0	$0	$50,000	$50,000	$0	$0	Improved safety	Motor carriers, state government, motorists	2B, 2D, 3A, 3B
Automated Driver Logbook	Conduct feasibility study and perform operational test demonstrating the use of technology for maintaining and reporting driver logbook information.	MCS PUC ISB FTR	3	$150,000	$0	$0	$0	$50,000	$50,000	$50,000	Improved carrier productivity, improved enforcement and safety	Motor carriers, state government, motorists	1A, 1B, 2A, 2B, 2D, 3A
Driver/Vehicle Real-Time Safety Monitoring System	Conduct feasibility study and perform operational test demonstrating the use of technology for vehicle diagnostic, driver status, and performance monitoring systems.	MCS PUC ISB FTR	3	$150,000	$0	$0	$0	$50,000	$50,000	$50,000	Improved enforcement and safety	Motor carriers, state government, motorists	1C, 3A
Total R&D/Operational Tests				$870,000	$320,000	$100,000	$100,000	$150,000	$100,000	$100,000			

Table 6: IVHS/CVO Coordination and Planning (1993 Dollars)

Project Name	Project Description	Implement Team	Years	Total Project Cost	Fiscal Year Funding Recommendations						Benefit	Stakeholders	Supports Goal/Objective
					1994	1995	1996	1997	1998	1999			
Western States Transparent Borders (RIB) Project	Describe regulatory and administrative framework, identify barriers, prepare "transparent borders" action plan for interstate commercial vehicle operations	FTR PUC MCS State Police	1	$50,000	$50,000	$0	$0	$0	$0	$0	Improved carrier productivity, enforcement	Motor carriers, state government	1A, 1B, 1D, 2A, 2B, 2C, 2D, 3C
IVHS America	Influence IVHS development, participate on technical committees, liaison with American and international IVHS network	FTR Research MCS ISB PUC, TES	6	$24,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	Improved efficiency and safety	Motor carriers, state and local government, motorists	2D
HELP, Inc.	Coordinate program development with western states, contract to obtain appropriate HELP, Inc. services	FTR PUC MCS	6	$240,000	$35,000	$35,000	$40,000	$40,000	$45,000	$45,000	Improved carrier productivity, enforcement	Motor carriers, state government	2D
Carrier/Stakeholder Outreach	Marketing research, develop tools to educate and gain support of CV operators for IVHS project participation	FTR PUC MCS	6	$30,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	Improved carrier productivity, enforcement	Motor carriers, state and local government	1A, 2A
USDOT IVHS Program	Maintain knowledge of IVHS research and development and operational test projects and funding, synchronize Oregon program with national program, obtain funding for operational tests	MCS FTR PUC	6	$0	$0	$0	$0	$0	$0	$0	Improved efficiency and safety	Motor carriers, state and local government, motorists	2D
Travel	Allows travel for administrative and planning activities for all of the above	MCS FTR ISB Research PUC	6	$162,000	$27,000	$27,000	$27,000	$27,000	$27,000	$27,000	Improved efficiency and safety	Motor carriers, state and local government, motorists	2D
Total Coordination & Planning				$506,000	$121,000	$71,000	$76,000	$76,000	$81,000	$81,000			

Appendix A: SourcesA: Sources

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Appendix B: Oregon IVHS/CVO Cost-Benefit AnalysisB: Oregon IVHS/CVO Cost-Benefit Analysis

This appendix describes the method and model used to analyze the costs and benefits of the mainline preclearance and enforcement network strategies. The analysis is adapted from the models used in NCHRP Report 303, "Feasibility of a National Heavy-Vehicle Monitoring System."

The general structure and assumptions are as follows.

1. Description of stations and average daily truck travel. Information on hours and days of operation and truck traffic were obtained for each weigh station and port-of-entry. Twenty stations were selected as potential project sites based upon annual average truck traffic. Growth in truck traffic at each potential site over the next twenty years was estimated based upon historical growth rates at each site.

2. Time savings for AVI-equipped trucks. Time savings for AVI-equipped trucks bypassing the weigh station is estimated to be three minutes for queuing, weighing and other inspection activities and an additional two minutes for deceleration and acceleration.

3. Estimates of costs and benefits. Public costs are detailed in the business plan and include all initial and recurring capital and operating costs. Public benefits include reduced tax administration costs of $40 per truck per year, reduced damage from overweight trucks and reduced tax evasion. Damage from overweight trucks is currently estimated at $20 million per year and is expected to be gradually reduced by 20% over the next twenty years. Tax evasion is expected to be gradually reduced by one percent of total collections.

Private costs include the installation, maintenance and replacement of transponders and on-board computers. As this equipment will be compatible with IVHS/CVO programs in adjacent states, 28.5% of the equipment costs are assigned to Oregon for this analysis. Private benefits include reduced delay by AVI-equipped trucks valued at $44 per hour or 73 cents per minute and reduced paperwork costs of $40 per truck per year. In addition, the cost of delay is non-linear and is believed to increase as delay time increases. This component of delay cost was not quantified but was assigned a nominal value of one dollar.

4. Time stream of costs and benefits. Public maintenance and operating costs are

assumed to be 10% of the cost of installed equipment per year. Private equipment is assumed to have a ten year replacement cycle.

5. Net present value (discounted) of costs and benefits. A discount rate of 7% was used to calculate net present costs and benefits. No adjustment for inflation was made for any benefit or cost.

6. Best case - worst case scenarios. In the base case participation in the program increases from 3% in the first year to 60% in twenty years. The cost of damage from overweight trucks is reduced by 20% and tax evasion is reduced by 1% of total tax collections over the next twenty years. The internal rate of return on investment is 41% and the benefit-cost ratio is 3.6:1.

In the best case scenario transponders become mandatory after ten years. The cost of damage from overweight trucks is reduced by 40% and tax evasion is reduced by 2% of total tax collections over the next twenty years. The internal rate of return on investment is 56% and the benefit-cost ratio is 5.3:1.

In the worst case scenario participation peaks at 10%. The cost of damage from overweight trucks is reduced by only 1% and tax evasion is reduced by 1/10th of 1% of total tax collections. The internal rate of return on investment is 7.6% and the benefit-cost ratio is 1:1.